National Institute for Occupational Safety and Health

NIOSH

# Comments to MSHA

Comments of the
National Institute for Occupational Safety and Health
on the
Mine Safety and Health Administration Proposed Rule
Underground Coal Mine Ventilation — Safety Standards for the Use of a Belt Entry as an Intake Air Course to Ventilate Working Sections and Areas Where Mechanized Mining Equipment is Being Installed or Removed

30 CFR Part 75

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control and Prevention
National institute for Occupational Safety and Health

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The National Institute for Occupational Safety and Health (NIOSH) has reviewed the Mine Safety and Health Administration (MSHA) Proposed Rule *Underground Coal Mine Ventilation —Safefy Sfandards for the Use of a Belf Entry as an Intake Air Course to Ventilate Working Secfions and Areas Where Mechanized Mining Equipment is Being Installed or Removed.* The following comments address two issues of previous concern regarding the safety of using belt entry air for ventilation [NIOSH 1989; 1990] that have been addressed in the current notice of proposed rulemaking—respirable dust and atmospheric monitoring systems. We are also submitting comments regarding the integrity of escapeway air and life lines. NIOSH appreciates this opportunity to comment on the MSHA proposal.

## RESPIRABLE DUST

### Respirable dust at longwalls

The relationship between intake air passing through belt air courses (belt air) and respirable dust levels at longwalls was examined in a longwall survey [Colinet et al. 1997]. This survey measured airflows and dust levels at six longwalls that used belt air and seven that did not, and found the following:

- In those mines using belt air, the average concentration of dust in the belt entry was 0.6 mg/m$^3$, and the average concentration of dust in the intake entry was approximately the same, 0.5 mg/m$^3$.

- In those mines using belt air, the average concentration of dust at the shearer (during cutting) was 3.7 mg/m$^3$. Thus the lower belt entry concentration of 0.6 mg/m$^3$ had a dilution effect on the higher dust concentration at the shearer.

- In those mines using belt air, the average airflow serving to dilute dust (and methane) along the longwall face (55,000 cfm) was almost twice that found in the mines that did not use belt air (28,000 cfm). The large difference indicates that belt air represented additional fresh air brought into the mine, not diverted intake air.

- In those mines using belt air, the average dust concentration at the shearer (3.7 mg/m$^3$) was comparable to the average dust concentration at the shearer in those mines not using belt air (4.1 mg/m$^3$).

### Respirable dust at continuous miner sections

In 1992, Potts and Jankowski conducted a case study in a continuous miner section to determine the impact of using belt air courses for intake or exhaust ventilation on various section occupations. For two days, the belt entry was used as an intake; for the following two days the airflow was reversed and the belt entry was used to draw air away from the face. Under both conditions, the airflow in the belt entry was 6000 cfm. Potts and Jankowski found that:

- The average dust level in the belt entry under both conditions was 0.66 $mg/m^3$.

- Dust concentrations at the miner operator were comparable during cutting when the belt entry was used for intake (4.4 $mg/m^3$) and exhaust (4.8 $mg/m^3$) ventilation.

*ATMOSPHERIC MONITORING SYSTEMS*

The development of improved atmospheric monitoring systems with fewer failures and false alarms has addressed NIOSH's previous reliability concerns. To further enhance their reliability, NIOSH has the following suggestions for implementing atmospheric monitoring systems:

*75.301 Definitions*

*"Carbon monoxide ambient level. The average concentration of carbon monoxide detected in an air course containing carbon monoxide sensors. This average is representative of the composition of the mine atmosphere during a non-fire condition."*

NIOSH suggests that the CO ambient level be determined by monitoring the air for a specified period of time, such as two to four weeks, within the entry or entries to be protected prior to the commissioning of the installed CO system to help achieve an accurate average ambient level for CO.

*75.351* **Atmos monitoring systems**

*"(e) Location of sensors—belt air course.*

*(4) Not more than 100 feet downwind of each belt drive unit, each tailpiece transfer point, and each belt take-up. If the belt drive, tailpiece, and/or take-up are installed together in the same air course they may be monitored with one sensor located not more than 100 feet downwind of the last component;. . ."*

NIOSH suggests that sensors be located in the major air split at distances no less than 50 feet and no greater than 150 feet downstream of each belt drive unit, each tailpiece, each transfer point, and each belt take-up. The distance downstream of the fire at which the combustion products reach a CO sensor near the roof depends on the relative values of the upward buoyant combustion product velocity and the ventilation air velocity. As the ventilation air velocity increases relative to the buoyant combustion product velocity, the distance downstream of the fire at which combustion products reach the roof increases. In the case of small fires, the ventilation air velocity is much greater than the buoyant combustion product velocity [Edwards and Friel 1996]. Consequently, the specification of "not more than 100

feet downwind" could possibly result in sensors being located so close to the fire that the smoke or CO goes undetected until the next sensor downstream is reached, reducing the early-warning capability of the atmospheric monitoring system.

## Escapeway air integrity

MSHA's Preamble discussion section *A. General Discussion—30 CFR, Part 75, Subpart D--Ventilation* on page 3948 notes the advantages of pressure balanced ventilation systems for controlling fires. Leakage of smoke into escapeways during mine fires is a recognized problem. However, this leakage is difficult to eliminate because mine-wide pressure balancing between belt and intake entries is difficult to achieve, and pressure differences between intake and return entries is necessary. As a result, NIOSH believes that the additional measure of life lines can improve the likelihood of escape from mine fires.

**MSHA notes in the Preamble that,**

***". . . we have not included a requirement for life lines in the proposed rule. We specifically solicit comments on the need for and the maintainability of lifelines in escapeways."***

NIOSH suggests that MSHA consider an additional requirement for the installation of directional life lines in escapeways. Life lines enable miners to escape through dense smoke. They improve the likelihood of escape by providing an element of safety redundancy not otherwise provided by atmospheric monitoring systems. The need for redundant safety systems is a well-established principle of safety engineering. The fire safety benefits of life lines have been discussed by Kissell and Litton [1992], and Kissell et al. [1993]. Directional life lines can improve fire safety in mines, whether they use belt air or not.

## REFERENCES

Colinet JF, Spencer ER, Jankowski RA [1997]. Status of dust control technology on U.S. longwalls. Chapter 55. Pittsburgh, PA: Proceedings of the 6th International Mine Ventilation Congress, May 1997.

Edwards JC and Friel GF [1996]. Comparative in-mine evaluation of carbon monoxide and smoke detectors. RI9622, 11 pages.

Kisseli FN and Litton CD [1992]. How smoke hinders escape from coal mine fires. Mining Engineering, January 1992, pp. 79-83.

Kissell FN, Timko RJ, and Litton CD [1993]. Ranking factors impacting survival during coal mine fires. Mining Engineering, August 1993, pp. 1077-1083.

NIOSH [1989]. Comments of the National institute for Occupational Safety and Health on the Mine Safety and Health Administration's Report, "Belt Entry Ventilation Review: Report of Findings and Recommendations." Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health.

NIOSH [1990]. Testimony of the National Institute for Occupational Safety and Health on the Mine Safety and Health Administration's Report, "Belt Entry Ventilation Review." Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health.

Potts JD and Jankowski RA [1992]. Dust considerations when using belt entry air to ventilate work areas. Pittsburgh, PA: U.S. Department of the Interior, Bureau of Mines, Report of investigations 9426.